

What do bridge engineers mean by “cable-spinning?”

“Cable spinning,” is a mechanical process whereby steel wires get carried between the anchorages and over the towers until a total of 19,000 miles of steel wire have been spun. But what exactly do bridge engineers mean when they refer to “spinning the cable?”

Will it resemble the work of a spider spinning a web, or the process of yarn being spun on a 19th century great wheel? Like the very first threads of a spider’s web or yarn rotating around a spinning wheel, the new bridge’s cable wire will be making repeated loops. When it’s time to spin the main cables, massive spools of steel wire will be secured to each anchorage; a spinning wheel will pull individual wires off of the large spools. Then, as the pencil-thin wire makes its way across the water and back, each wire is laid parallel to the other. As the pilot rope (a wire that guides cable being spun) moves, the spinning wheel follows. The wheels that carry wire travel up and over the towers, across the water to the opposite anchorage and back again.



A spinning tensioning tower

For about three months, crews will spin the steel wires in groups of four across the Narrows. When the first 464 wires have made the journey, they will be combined into a single strand. A total of 19 strands, each containing 464 wires, will be compacted and wrapped to complete the main suspensions cable. A total of 8,816 individual steel wires are needed to create a 20½ inch cable.

How many wires make a cable?

Steel cables support the weight of a suspension bridge deck and the vehicles that travel upon it. How many individual wires should each cable contain? As suspension bridges go, the number of wires in each strand, the number of strands in each cable and the number of cables vary from bridge to bridge. For example, the Brooklyn Bridge has four cables, each containing 5,358 wires. The Golden Gate Bridge has two cables each with 27,572 wires. The 1950 Narrows Bridge has 19 strands per cable, with each strand containing 458 wires. The new bridge will also have 19 strands per cable, but each strand will contain 464 wires per strand. Why so different? It depends on a several factors including the length and width of the span, the height of the towers, and the geometry (e.g. “sag”) of the cables.



Spooling of cable wire at east anchorage, one of six reels per spool.

Public Outreach

- Facilitated KBTC TV feature for “Soundviews” program;
- Coordinated media coverage for first pilot wire;
- Edited article for technical journal Concrete Engineering, Int’l;
- Provided several tours to interested groups;
- Provided project presentations at various community and business groups;
- Met with community partners to discuss bridge opening ceremonies.

[www.tacomanarrowsbridge.com](http://www.tacomanarrowsbridge.com)



toll booths

Toll Operations

July

- Hired Toll Operations Manager, Customer Service Manager, and a Financial Analyst. They will start in August;
- QA/QC Plan finalized and approved;
- Test Plan was approved;

August

- Receive Installation and Design Drawings from TransCore;
- Review Test procedures;
- Approve Final System Design Document;
- Conduct walkthrough of toll facilities for turnover; and
- Continue contract negotiations for Toll Operations Agreement.

Preparation for the commencement of tolling is progressing on schedule.

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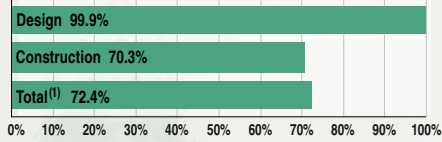
For more information about the bridge project, visit the TNB web site:

[www.tacomanarrowsbridge.com](http://www.tacomanarrowsbridge.com)



Progress to Date

(% Complete)



(1) Weighted 7% Design progress and 93% Construction progress

New Bridge Statistics:

Bridge Length:

5,400 ft. *(overall)*

Main Span:

2,800 ft. *(tower to tower)*

Deck Panels:

46 sections, 120 ft. by 78 ft. *(each)*

Tower Height:

510 ft. tall

8,500 cubic yds. concrete

*(per tower)*

Tower Foundations

or **Caissons** *(each):*

- 1.7 million lbs. steel *(total)*
- 850,000 lbs. steel *(base or cutting edge)*
- 6 million lbs. rebar
- 30,000 cubic yards concrete

Anchorage *(each):*

- 20,600 cubic yards concrete
- 900,000 lbs. rebar
- 90 million lbs. *(total weight)*

**Cable Diameter:** 20.5 inches

**Steel Bundles per Cable:** 19

**Wires per Bundle:** 464

Structural Steel:

35.5 million lbs.

*(excludes weight of cables)*

49.7 million lbs.

*(all steel excluding towers)*

New Parallel Bridge Completed:

Early 2007

1950 Bridge (Retrofit) Completed:

Early 2008

# Tacoma Narrows Bridge Project

## Monthly Progress Report

July 2005



Suspension crews rig the first pilot line from the Gig Harbor shore to the west tower.

### Connecting Land to Sea: the Birth of Cable Spinning

Tacoma Narrows Constructors reached a new milestone in mid-July when workers stretched the first steel line from the west shore of the Narrows to the top of the Gig Harbor tower. Pulling the 5/8-inch “pilot line,” and connecting it to another wire lowered from the tower is the first phase of installing the suspension system. During August, suspension crews will be installing the catwalks and rigging in preparation for spinning the main suspension cables. Spinning of the 20½ -inch main cables is expected to begin in mid-September and finish in mid-December of this year. (For more on spinning turn to the back page).

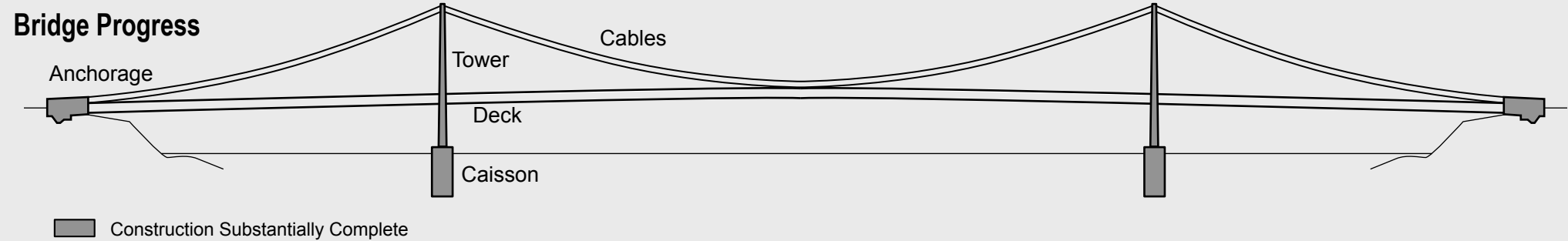


### Towers Completed

The last concrete pours to the upper cross struts marked the substantial completion of the two towers, capping off 12 months of tower construction. The two towers, standing 510 feet above the water, were essentially completed with a concrete pour to the east tower upper strut on July 23, 2005. Only a few minor concrete pours are left but those that cannot be completed until cable spinning is finished later this year. Nearly 18,000 cubic yards of concrete were placed in the towers, enough concrete to cover an entire football field 9 feet deep. In the photo at left crews celebrate the completion of the Gig Harbor (west) tower the in June.







## Bridge Progress

As of the end of July, the project is on schedule to meet all contract milestones. In July, Tacoma Narrows Constructors reached a major milestone with the completion of the east and west towers. Crews placed the tower saddles that will cradle the suspension cables on top of both towers and started rigging for the cable catwalks. The first pilot line, catwalk, floor, cables, and tower tie back strands were placed from the Gig Harbor shore to the west tower. On the two anchorages, crews completed placing the anchor rods, which will support the main suspension cables, and placed temporary equipment for cable spinning activities. Overseas, several bridge deck sections are now complete and fabrication work continues on the remaining deck sections.

Bridge Activities scheduled for August include:

- Continue catwalk strands and mesh deployment
- Install cable tram rope frames
- Tension tower tie-back strands

## Milestone Summary

Milestone	Contract	TNC	Months Ahead
Complete toll facility construction	Dec-05	Aug-05	3.3
Start new bridge deck installation	May-06	Feb-06	2.7
Complete Superstructure joining of deck sections	Dec-06	Aug-06	3.2
Complete new bridge and open to traffic	Apr-07	Apr-07	0.0
Complete existing bridge modifications	Feb-08	Feb-08	0.0

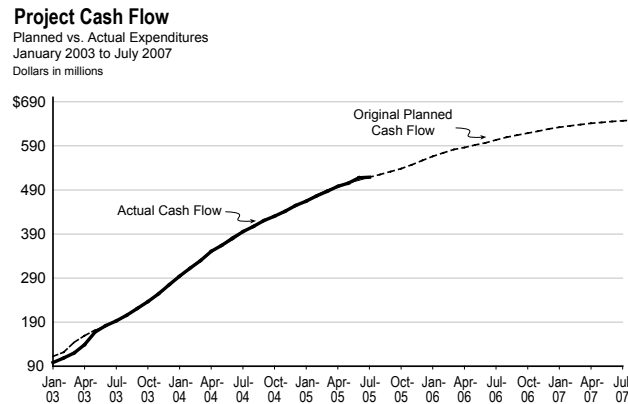
## Roadway/Roadside Progress

Roadway activities in July included excavation for the stormwater pond (Pond C) at the west end of the bridge, median barrier wall construction between Jackson Avenue and the bridge, and new mainline paving along the eastbound approach to the new bridge on the Gig Harbor side.

Activities planned for August include paving of mainline express lanes near the toll plaza; continued construction of Pond C, once temporary batch plant is removed and flagstone paving, irrigation installation and planting at Living War Memorial Park.

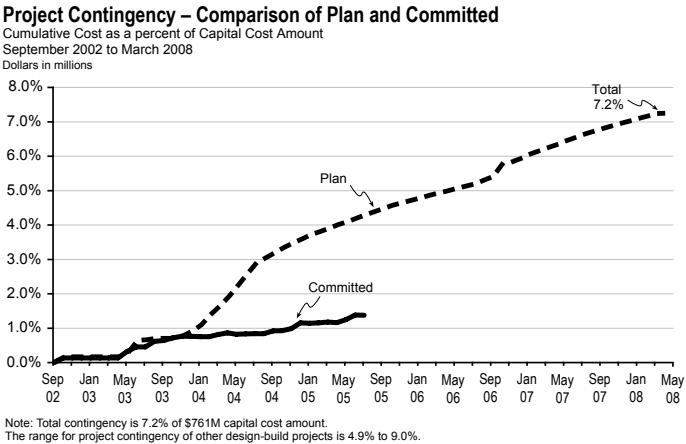
## Financial Status

Project Cost Summary (in Millions)	Budgeted	Expended
Design-Build Contract	\$615.0	\$498.9
Toll System Contract	9.2	3.8
WSDOT Oversight	41.0	16.4
Contingencies Committed	10.5	5.6
Contingencies Remaining	44.2	
Phase I Dev. Cost (UIW)	40.5	39.8
Total	\$760.4	\$564.5
Total Expended/Total Cost	74.2%	



## Project Contingency Use

WSDOT has budgeted \$54.7 million for contingencies on this project. To date, 10.5 million have been committed to changes in the project. These changes are the result of right of way settlements, changed permit conditions, pricing efficiencies, community driven improvements, contractual discrepancies, and maintenance and operations life cycle considerations.



## Environmental Performance

The Tacoma Narrows Bridge Project is conducting several environmental improvement projects as part of the construction of the new bridge. One of those efforts is to improve juvenile rockfish habitat at Toliva Shoal, south of the Narrows near Steilacoom. In the photos below crews place additional rock at the shoal.



photos courtesy of Tacoma Narrows Constructors

### Location of Toliva Shoals.



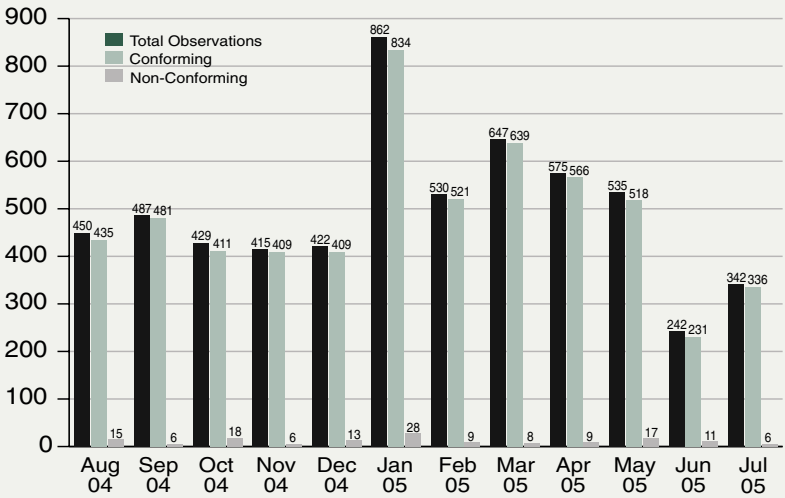
Tug Henry Foss



West anchorage

## Quality Performance

During July, WSDOT staff completed the following audits:



WSDOT employs a Compliance Audit System to ensure that work on the project conforms to contract requirements. Compliance audits are conducted regularly in two areas: construction activities occurring in the field, and management policies and systems designed to ensure a quality product. Field audits measure construction performance against the contract plans and specifications. Management system audits measure performance against such items as the Design/Builder's Quality Management Plan; WSDOT policies and procedures; Project Management Plan; and other contractual and legal requirements.

Compliance Audit System findings for the month of July are as follows:

- 28 individual audits of design/builder work activities;
- 342 contractual requirements observed and verified for compliance; and
- 6 non-conformance findings.

The findings continue to indicate that construction work is generally complying with contract requirements.

## Safety Performance

1,807,570 hours worked with one lost time accident.

July-05	Hours Worked	Recordable Cases	LWD Cases	Lost Workdays	Restricted Cases	Restricted Days	Fatalities
TNC	41,801	0	0	0	0	0	0
WSDOT	5,360	0	0	0	0	0	0
Total	47,161	0	0	0	0	0	0
<b>Project to Date</b>							
TNC	1,621,379	16	1	22	5	186	0
WSDOT	186,191	0	0	0	0	0	0
Total	1,807,570	16	1	22	5	186	0